HIGHLY CONFIDENTIAL – OUTSIDE ATTORNEYS' EYES ONLY

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

SPHERO, INC.	§	
	§	
Plaintiff,	§	
	§	
v.	§	Civil Action No. 1:17-cv-5428
	§	
	§	
SPIN MASTER LTD. and,	§	
SPIN MASTER INC.,	§	
	§	
Defendants.	§	

AFFIDAVIT OF DR. JASON JANÉT RESPONDING TO ISSUES RAISED IN SPHERO'S MOTION FOR A PRELIMINARY INJUNCTION

I, Jason Janét, after being duly sworn, state and affirm the following:

I. INTRODUCTION

1. I, Jason Janét, have been retained by counsel for Spin Master LTD. and Spin Master, Inc. ("Defendants"). I have been asked to review and analyze Sphero's motion for preliminary injunction and supporting paperwork to offer my initial opinions as to the questions of infringement and validity of claims 19 and 20 of the '920 patent.

2. This affidavit sets forth the opinions I have formed based on my analysis of Sphero's Motion for Preliminary Injunction and the accompanying exhibits including the declarations of Sphero's experts, Mr. Dirk Duffner and Dr. Erich Phillips, and provides the bases and reasons for those opinions. A full list of materials I reviewed in preparing this affidavit is attached as Exhibit A. This affidavit is based on information currently available to me. I may continue my investigation and study, which may include a review of documents and information that may be produced or subsequently presented, as well as deposition testimony from depositions that may yet be taken in this case. Therefore, I reserve the right to expand or modify my opinions as my investigation and study continues, and I may supplement my opinions and/or provide rebuttal opinions in response to any additional information that becomes available to me, any matters raised by plaintiff and/or in light of any relevant orders from the Court.

3. I expect to be called to provide expert testimony in Court regarding the opinions I have formed resulting from my research and investigation as set forth in this affidavit. As part of my testimony, I may provide background on the patent and reserve the right to use visual aids to illustrate my testimony.

4. I am being compensated in this matter at my customary rate of $375/hour. My compensation is in no way affected by the outcome of this litigation.

II. BACKGROUND AND QUALIFICATIONS

5. My credentials are set forth in full detail in my *Curriculum Vitae* which is attached as Exhibit B to this declaration and summarized as follows: I am currently the division CEO for Delta Five Systems. I hold the rank of Adjunct Associate Professor at Duke University and at North Carolina State University.

6. I received a Bachelor of Science in Mechanical Engineering from the University of Virginia in 1990; a Masters of Integrated Manufacturing Systems from the Integrated Manufacturing Systems Engineering Institute at North Carolina State University in 1994; and a PhD in Electrical and Computer Engineering from North Carolina State University in 1998.

7. Since 1991, I have been active in the robotics and automation field. I have authored numerous publications and have co-authored a textbook entitled *Computational Intelligence.*

8. I have designed, built, and marketed robots, automated systems, and components thereof, including ground mobile robots, unmanned aerial vehicles (UAV), automated storage and retrieval systems (ASRS), submersible mobile robots, and proof-of-concept extra-terrestrial robots.

9. I have taught the following courses: Introduction to Robotics and Automation (Duke and NCSU); Introduction to Control Theory (Duke and NCSU); Distributed Real-Time Controls (NCSU); and myriad independent studies courses in the areas of robotics, automation, artificial intelligence, autonomy and control systems. I have also served on several MS- and PhD-level graduate student committees, designed qualifying exam problems, served on the NCSU IMSEI Board, and participated in curriculum development for undergraduate and graduate level programs.

10. I have also started and/or advised multiple champion student teams for international robot competitions including, but not limited to, the NASA/ASCE Extra-Terrestrial Robotics

Competition, the DARPA Grand Challenge, the AUVSI/ONR Autonomous Underwater Vehicle Competition, and the European CLAWAR Wall-Climbing Robot competition.

11. I have initiated multiple unmanned aerial vehicle (UAV) projects at both academic and industry levels. Academic UAVs include, but are not limited to, Quadcopters with Hybrid Remote and Autonomous Control, Marsupial UAVs that Deploy and Recover Unmanned Ground Vehicles, and Wall-Climbing UAVs. Additionally, the AngelFish Cross-Domain Submersible UAV, a DARPA ASW program that I initiated at Teledyne, included a partnership with North Carolina State University.

12. In 1999, while I was employed by Nekton Research ("Nekton"), I captured and managed multiple programs sponsored by the Department of Defense (DoD) and private-sector companies that focused primarily on autonomous underwater vehicles (AUV), remotely operated vehicles (ROV) and indirect-fire projectiles. During my tenure, Nekton entered into a joint venture agreement with the founders of what eventually became known as Parata Systems – a pharmacy automation solutions company, which I supported launching.

13. After leaving Nekton in March 2002, I joined a then New Jersey-based company called Avionic Instruments, Inc. ("Avionic"). While at Avionic, I continued developing and marketing robots and supported engineering related to various design, manufacturing, quality and assembly issues on the core aerospace product lines. Avionic product lines include, but are not limited to, ducted fans, transformer-rectifier units (TRU), regulated TRU (RTRU), auxiliary power unit (APU) control systems, power distribution systems (PDU), frequency converters, corner clamps, and VRAM attractors/thrusters. Customers included DoD, NASA, Boeing, Sikorsky, Augusta-Westland, Dassault, and Lockheed-Martin.

14. At Avionic, I was also tasked with ruggedizing, optimizing, and commercializing a core proprietary technology called the Vortex Regenerative Air/Aqueous Movement ("VRAM"). The VRAM had several applications, including but not limited to: holding breaching charges and sensors against vertical or inverted surfaces; acting as an attractor for wall and ceiling climbing robots; acting as an attractor for submersible hull-crawling robots; filter-less vacuuming (conceptually similar to the Dyson vacuum); and robotic pick-and-place end-effector (conceptually similar to a gripper) to move articles from one location (e.g., a conveyor) to another (e.g., a collator).

15. My work with the filter-less vacuum VRAM prompted me to explore a concept related to pharmacy automation, which ultimately led to a ferris-wheel concept for rapidly dispensing pills. In mid-2003, my team conceived of two prescription pill counting mechanisms that actually benefitted from centrifugal forces and optimally exploited gravity and vacuum: an inner ring with vacuum-based apertures and an inner-bowl with vacuum-based apertures. The inner-bowl with vacuum-based apertures was deemed most viable, was awarded two US patents, and to this day forms the basis of the RxMedic ADS™ pharmacy robot. The VRAM formed the basis of Vortex HC technologies, many of which have been licensed out to entities including, but not limited to Teledyne SeaBotix, SeaRobotics, and HDT. Both RxMedic and Vortex HC were officially spun out of Avionic in July 2004, at the date Avionic was sold to Transdigm.

16. In late 2004, soon after Avionic was sold, I, along with others from Avionic, secured funding to develop an alpha-level multi-dispenser robotic system and afforded me time to write the RxMedic business plan and raise multiple rounds of venture capital. In late 2006, RxMedic (called "APDS" until November 2006) was launched as a stand-alone, sole-focus venture. After the operational launch of RxMedic, I served as General Manager and eventually Chief Technical

Officer. Through my roles at RxMedic, I oversaw the development of the RxMedic ADS robot, managed the intellectual property portfolio, coordinated sales and marketing, and provided strategic, fiscal, and operational leadership. In May 2010, J M Smith Corporation acquired RxMedic, and in an effort to assist in the change of ownership, I served as a director of RxMedic until May 2011.

17. Also in late 2004, after Avionic was sold, I, along with others from Avionic, secured funding for Vortex HC through DoD contracts and robot sales, to continue developing the VRAM Mobile Robot Platform (VMRP – a wall-climbing robot), the ARTEMIS AUV (a holonomic submersible robot for counter-mine and counter-obstacle operations), the submersible crawler, the nuclear-grade boiler water reactor (BWR) inspection robot, and other robot products centered around the VRAM. Some DoD programs were/are classified, for which I maintained a SECRET clearance at both the personal and facilities level, and served as the facilities security officer (FSO). In late 2006, corresponding to the full launch of RxMedic, Vortex HC technologies were largely licensed to Teledyne, SeaBotix, SeaRobotics, and HDT. However, I have continued to support Vortex HC licensees and customers to-date.

18. After the sale of RxMedic, and after fulfilling my 12-month employment obligation, I joined Teledyne Technologies in Summer 2011. I served as the Senior Manager for the RTP division of Teledyne Scientific, and supported multiple DoD-sponsored robotic-focused programs. Some of these programs were/are classified, for which I maintained a personal SECRET clearance. Among these programs, were cargo unmanned ground vehicles (CUGV), squad-level autonomous unmanned ground vehicles (UGV), autonomous underwater vehicles (AUV), unmanned underwater vehicles (UUV), and a cross-domain autonomous vehicle capable of transitioning between air-, surface- and underwater-domains. Cross-domain vehicles that were evaluated,

designed and prototyped included, but were not limited to, the AngelFish (later called "EagleRay") submersible AUV for anti-submarine warfare, and a ball-shaped robot for countermine operations on the ground, in the beach zone and in the surf zone. Sensor design, refinement and signal processing was a major component of each program. Sensors employed include, but are not limited to: proximity sensors; ranging sensors; electro-optical imaging; long-, short- and mid-wave infrared (IR); inertial measurement units (IMU); optical flow; and radio-frequency (RF). Additionally, control systems were designed, refined and integrated into the aforementioned systems. Most control systems were closed-loop, in that they utilized sensor-based feedback; others were open-loop, where states were estimated with little or no feedback.

19. In late 2013, Avionic, a Transdigm business unit at that point, requested that I return to turn around a supply-chain issue, and assume management of its Sikorsky S97 Raider helicopter program. The S97 Raider is purported to be the fastest, most maneuverable helicopter, due to its coaxial, counter-rotating variable-pitch wings, and an aft-based push-propeller. Avionic also controlled two business units named Acme Aerospace (Acme) and Aerospace Cooling Solutions (ACS). Avionic, Acme and ACS supported the S97 program, which has met milestones and continues to produce multiple successful demonstrations. In 2013, Transdigm expanded my role to include directorship of the Avionic, Acme and ACS sales and marketing team, and to report operational and financial status at six-week intervals. Transdigm required that I move my family to New Jersey in late 2014, which influenced my then-reluctant decision to resign and assume the CEO role of Delta Five Systems in Raleigh, NC.

20. Delta Five Systems is comprised of two divisions: 1) a robotics division; and, 2) a post management division. The robotics division focuses on the application of automated systems in hospitality. The pest management division focuses on internet-of-things (IoT) unattended

sensors for round-the-clock monitoring, detection, capture and reporting of a broad spectrum of pests.

III. LEGAL FRAMEWORK

21. I am not a legal expert and offer no opinions of the law. However, I have been informed by counsel of the various legal standards that apply, and I have applied those standards in arriving at my conclusions.

A. Claim Construction

22. I understand that claim terms and phrases generally must be given their plain and ordinary meaning unless the patentee provided a special meaning. In particular, I understand that claims must be read in light of the description of the invention in the patent specification. I also understand that the prosecution history can further inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, thus making the claim scope narrower than it might otherwise be.

B. Infringement/Non-Infringement

23. I understand that patent claims define the invention. I also understand that an infringement analysis is a two-step process. First, the claims of the patent are construed to resolve any disputes as to their meaning and scope. I understand the asserted claims in this case have not been construed.

24. Second, the construed claims are then compared to the accused device to determine whether the claim is infringed. I understand that each construed patent claim that has been asserted must be compared to the accused product to determine whether each claim limitation is present in the accused product. I understand that there are two types of infringement, literal infringement and infringement under the doctrine of equivalents. I understand that for an accused product to

literally infringe a claim, the accused product must incorporate every limitation in a valid claim, exactly. Absent any limitation of a patent claim, an accused device cannot be held to literally infringe the claim.

25. I understand that to infringe a dependent claim, the accused product must include each and every limitation of that dependent claim, and each and every limitation of the independent claim(s) from which it depends. Thus, a dependent claim cannot be infringed if the independent claim from which it depends is not infringed.

26. In addition to direct infringement discussed above, an accused infringer may be found liable for infringement of an asserted patent where the accused infringer induces infringement by actively and knowingly aiding and abetting another's direct infringement.

27. To establish that the accused infringer induced infringing acts, the patentee must show that a third party or "inducee" committed an act of direct infringement. Further, the accused infringer must engage in specific affirmative acts, and not merely a failure to act, that induced, aided or abetted the act that directly infringed the patent (i.e., "inducing acts"). The accused infringer must have known of the asserted patent and the direct infringement at the time it committed the inducing acts. And the accused infringer must have had a specific intent that another infringe the patent. Mere knowledge of the direct infringer's actions does not amount to inducement. Further, a mere financial relationship between two parties, or a mere sale of a product, is insufficient to establish inducement.

28. I also understand that inducement requires that the accused inducer affirmatively encouraged the direct infringer to infringe each limitation of the claim, and that encouragement of inducement of less than all of the claim limitations does not constitute inducement of infringement.

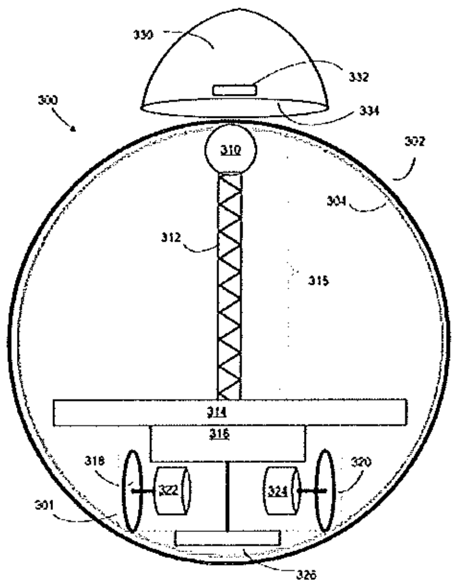
C. Invalidity

29. I have also been informed that the express or inherent disclosures of a prior art reference may anticipate the claimed invention. Specifically, if a person having ordinary skill in the art at the time of the invention would have known that the claimed subject matter is necessarily present in a prior art reference, then the prior art reference may "anticipate" the claim. In other words, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. There is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of invention, but only that the subject matter is in fact inherent in the prior art reference. Therefore, a claim is "anticipated" by the prior art if each and every limitation of the claim is found, either expressly or inherently, in a single item of prior art.

IV. SUMMARY OF U.S. PATENT NO. 9,211,920

A. Summary of the '920 Patent

30. The '920 Patent generally describes a system including a self-propelled spherical device and a magnetically attached accessory device. '920 Patent at Abstract. The spherical device includes a spherical housing enclosing (among other things) a drive system 301 and an internal component 315, which is also referred to as a biasing mechanism. *Id.* at 9:52-55, Fig. 3.

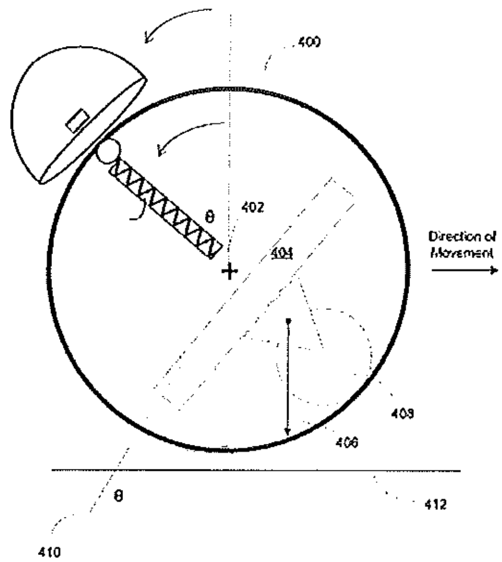


Id. at Fig. 3.

31. As shown in the figure above, the drive system 301 includes wheels 318, 320 driven by motors 322, 324. *Id.*; *see also, id.* at 9:41-44. The biasing mechanism 315 has a spring 312 and a spring end 310. *Id.* at 9:53-58. "The spring 312 is selected to provide a force to press the wheels 318, 320 and the spring end 310 against inner surface 304 [of the spherical housing]." *Id.* at 9:63-65, 10:13-16. The spring end of the internal component 315 includes a magnetic component that interacts with a magnetic component contained in the accessory device 330. *Id.* at 10:9-12, 10:36-37.

32. In operation, the biasing mechanism 315 is angularly displaced in a direction opposite the direction of movement as shown in the figure below:

HIGHLY CONFIDENTIAL – OUTSIDE ATTORNEYS' EYES ONLY



Id. at Fig. 4.

33. As demonstrated in Figure 4 above, when the drive accelerates from rest, for example, the drive initiates motion of the sphere by driving along the sphere's interior surface, moving away from the valley, and ascending the inner wall. As shown above, the drive system pitches up as it ascends the inner wall of the sphere. This results in the angular displacement of the internal component/biasing mechanism because it is rigidly attached to the drive system.

B. <u>Priority Date</u>

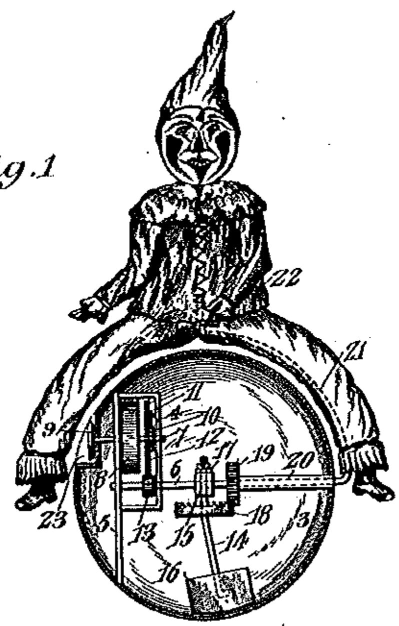
34. Counsel has informed me that the priority date of the '920 Patent is August 13, 2014. I also note that this is the same priority date applied by Mr. Duffner. *Duffner Declaration*, at ¶ 16.

C. <u>Background of the Technology</u>

35. By August 2014, the field of self-propelled spherical devices was extensive and well developed. Spherical, self-propelled devices have been known for well over a century. In the early 1900s, such devices were developed as toys and novelties. For example, U.S. Patent No. 933,623 to Cecil ("Cecil"), which issued on September 7, 1909, describes a mechanical toy "ball

or other rotating body contain[ing an] internal mechanism which acts to rotate the ball or body." Exhibit C, *Cecil* at lines 1:8-12. The internal mechanism causes the ball "to move either in a curved path or to take a sinuous or zig-zag path" via a wound spring, clockwork, and a weight on a rotating arm. *Id.* at lines 1:18-22; *see also, id.* at lines 1:55-2:36. As shown in the figure below, the ball "preferably support[s] a figure or other amusing device, which is balanced on the ball." *Id.* at 1:12-14.

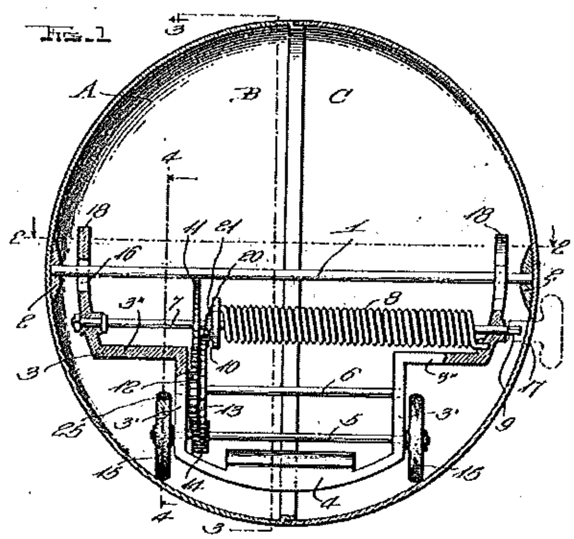
Fig. 1



Id. at Fig. 1.

36. Similarly, U.S. Patent No. 1,263,262 to McFaul ("McFaul"), which issued on April 16, 1918, describes a self-propelled ball having an internal driving mechanism causing the ball to "propel itself in a straight line" and automatically shift itself "if it should be checked at any point in its path of travel by some obstacle." Exhibit D, *McFaul* at 1:12-27. "The driving mechanism for propelling the ball comprises a pair of wheels 15 in frictional engagement with the inner surface of the sphere." *Id.* at 1:58-61. After winding a spring, "the ball is placed upon the surface on which it is to travel, the spring 8 will un-wind, operating the train of gears from which motion will

be transmitted to the wheel 15 which in turn, owing to their frictional engagement with the inner surface of the sphere will impart a rolling motion to the same." *Id.* at 2:61-69. A cross-section of McFaul's self-propelled ball, including the mechanical drive, is shown in the figure below:



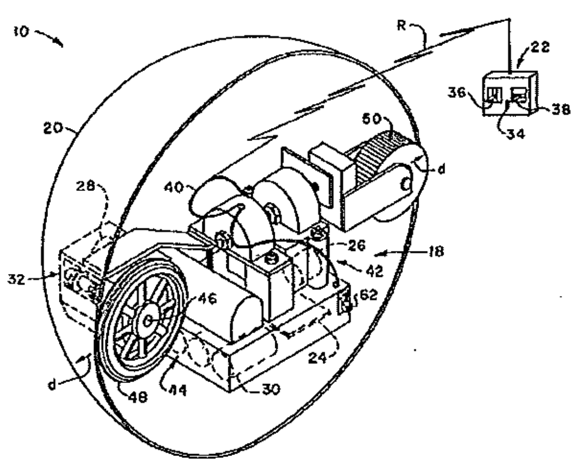
Id. at Fig. 1.

37. By at least the late 1950s to early 1960s, the drive systems of self-propelled spheres shifted from being purely mechanical to including electric motors powered by batteries. For example, U.S. Patent No. 2,949,696 to Easterling ("Easterling"), which was filed on May 21, 1957 and issued on August 23, 1960, describes "a battery propelled motorized ball which will propel itself and reverse direction when stopped by an obstruction." Exhibit E, *Easterling* at 1:15-18. Even at this early date, this design was considered advantageous because of its ability "to provide a simple, relatively inexpensive motorized toy which can be economically made and sold and which will keep children amused for hours." *Id.* at 1:37-40.

38. By at least the early 1980s, radio-controlled vehicles were becoming more commonplace, and radio-controls were similarly incorporated into self-propelled spherical devices. For example, U.S. Patent No. 4,541,814 to Martin ("Martin"), which was filed on

December 23, 1983 and issued on September 17, 1985, describes "a sphere with a radio controllable and steerable two-wheel vehicle inside having first and second wheels contacting a sphere at diametrically opposed points in the inner circumference." Exhibit F, *Martin* at 1:19-23.

39. Martin's system included a commercially available remote control transmitter 22 having control switches allowing the user to steer the vehicle within the sphere. *Id.* at 2:36-43 ("Remote control transmitter 22 may be that available commercially along with the responsive receiver 24 and steering subsystem 42 and associated power section 30 and drive subsystem 32, from Shinsei Corporation, Cerritos, Calif., as Model No. 1125 radio controlled toy jeep. The transmitter has an on-off switch 34, forward/reverse joystick type switch 36 and proportional joystick-type steering switch 38."). *Id.* at Fig. 1. As shown in the figure below, the remote controller wirelessly transmits control signals, which are received by an antenna within the sphere:



Id. at Fig. 1; *see also, id.* at 2:43-47 ("The signals are picked up by antenna 40 on the vehicle which receives them from the transmitter which in turn appropriately connects steering motor 26 and drive motor 28 with the power section 30, a battery pack, as required."). The sphere is made of

"hard thermoplastic . . . or any other suitably strong, rigid material permeable by radio waves R to permit remote control." *Id.* at 2:30-34.

40. A robot is generally understood to be a mechanical device that can be programmed to perform a task under automatic control. With the development of low cost Micro Electro Mechanical Systems (MEMS) inertial sensors in the early 1990s, the development of mobile robots became a focus of academic research. Exhibit G, *Fujita* at Figure 2 ("robot" application), Table 2 History of MEMS research topics, robot topics, p. 7 ("In terms of machine intelligence, it is possible to supply high-performance sensors and processors in large quantity and to integrate them in machines. All the necessary functions i.e., sensing, judgment and motion, to make machines more intelligent, can be implemented in one place. An intelligent machine may have large numbers of such closed-loop MEMS embedded in it."). Researchers recognized that a spherical design offered advantages, such as increased mobility, over other mobile robot designs (e.g., wheeled robots). Exhibit H, *Ishikawa* at 2311 ("An autonomous rolling sphere being capable of move, swing, and spin on all kinds of terrain – it has been a longstanding dream of robotics researchers. Spherical rolling is a locomotion principle that is essentially different from the other commoner ones, such as wheeled robots or walking robots. . . . In contrast, a spherical robot may have some advantages to the wheeled robots, e.g., it can move freely on the floor thanks to its complete symmetry, and is robust against uncertain terrains for its surface is smooth everywhere.").

41. As noted by Halme in 1996, "spherical construction offers extraordinary motion properties in cases where turning over or falling down are risks for the robot to continue its motion. Also it has full capability to recover from collisions with obstacles or another robots traveling in the environment." Exhibit I, *Halme* at Abstract. Halme also recognized that the omni-directional motion provided by spherical robots enhances mobility. *Id.* at 259 ("Mobility is one of the essential

features of mobile robots. In many cases omni-directional motion is favoured, an example of such design is presented in [1].").

42. Spherical mobile robots having many different types of drive systems have been developed over the last few decades. Ishikawa provides a summary of the conventional types of drive systems used in spherical mobile robots as of 2010:

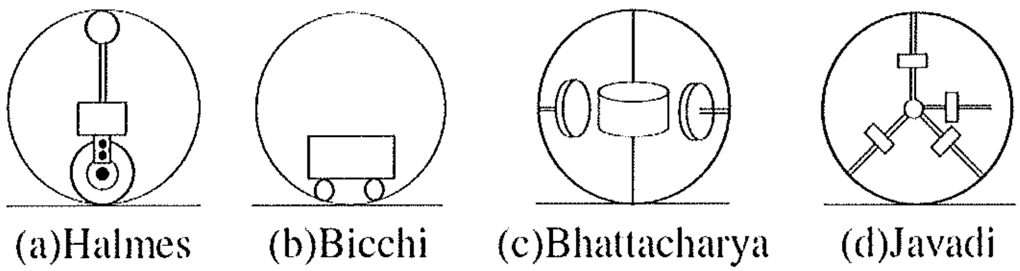
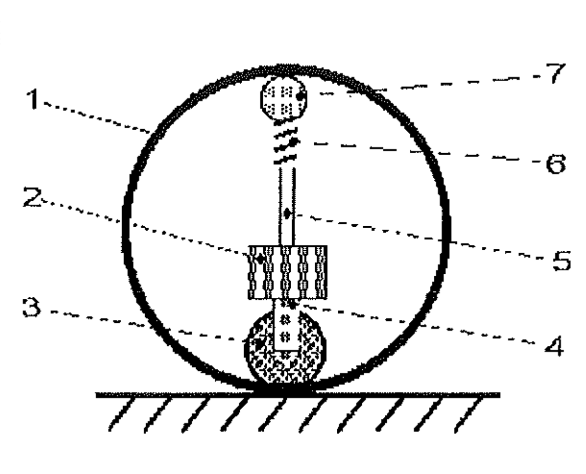
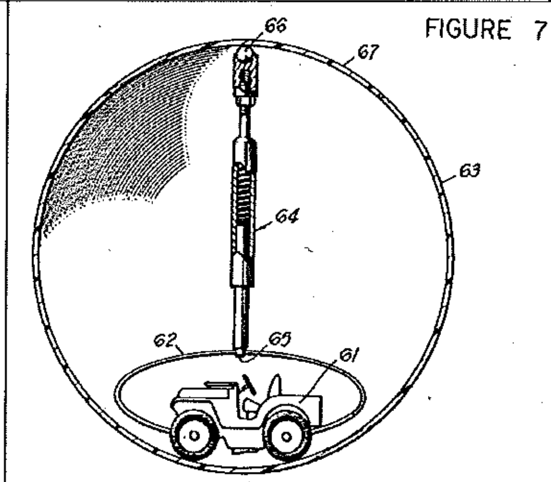


Fig. 1. Overview of conventional spherical robots

Exhibit H, *Ishikawa* at 2311. As shown above, Halme (a) and Bicchi (b) used wheeled drives positioned on the bottom of the sphere while Bhattacharya (c) used two perpendicular rotors and Javadi (d) relied on internal weights positioned by actuators. *Id.*

43. Many of the drive systems for these spherical robots were not new, but rather were borrowed from prior non-robotic, self-propelled spherical device designs. For example, Halme's use of a wheeled drive (2, 3, 4) supporting axis (5), spring (6) and balance wheel (7) is similar to a design for a self-propelled toy ball described in U.S. Patent No. 4,601,675 to Robinson, which issued on July 22, 1986 ("Robinson):

Halme (Exhibit I) Fig. 1	Robinson (Exhibit J) Fig. 7
	

44. Instead, researchers primarily focused on the development of control systems used to automatically control the motion of spherical mobile robots. The fundamental features of any control system include the controller, the system to be controlled (referred to as the plant), the actuator(s) associated with the plant that responds to command signals in order to modify the plant's behavior, and the sensor(s) that describes the plant's behavior through output signals. Generally, a controller causes a system variable (e.g., speed) to adhere to a particular value, which is called the reference value. The difference between the reference value and the sensor values is called the "error." The controller inputs an actuating signal, corresponding to the error value, to the plant via the plant's actuator.

45. Several well-known types of control systems have been used to control the motion of spherical robots. As documented by Ishikawa, for example, the spherical mobile robots developed by Halme, Bhattacharya and Javadi all utilized open-loop control systems while Bicchi utilized a closed loop control system:

author	Halme et al 1996	Bicchi et al 1997	Bhattacharya et al 2000	Javadi et al 2002
Driving Mechanism	Single Wheel	Car	Attached Rotor	Internal Weight
Input	1	2	2	4
Behavior	Kinematic	Kinematic	Kinematic	Kinematic
control	Open Loop	Closed Loop	Open Loop	Open Loop
planning	no planning	kinematic planning	dynamic planning	kinematic planning

TABLE I
COMPARISON OF SPHERICAL ROBOTS IN PREVIOUS WORKS

Exhibit H, *Ishikawa* at 2311.

46. The study of open loop and closed loop (i.e., feedback) controllers began hundreds of years ago. Exhibit K, *Franklin* at 12-15. An open loop controller provides an actuating signal corresponding to a reference value to the plant, but does not measure the output describing the plant's behavior. *Id.* at p. 17 ("In **open-loop control** the system does *not* measure the output and there is no correction of the actuating signal to make that output conform to the reference signal.") (emphasis in original). Therefore, there is no correction of the actuating signal to make the plant's output conform to the reference value. *Id.*

47. In contrast, a closed loop controller, which is also called a feedback controller, determines the plant's output behavior via the sensor and uses feedback of the sensed value to influence the actuating signals produced by the controller. *Id.* at p. 17 ("In **closed-loop control** the system includes a sensor to measure the output and uses **feedback** of the sensed value to influence the control variable.") (emphasis in original). Liu, for example, describes a spherical mobile robot including a feedback controller to control the robot's rolling speed by regulating the drive motor's velocity in accordance with a sensed rotational velocity. Exhibit L, *Liu* at Abstract

("BYQ-III is a spherical mobile robot. This paper deals with the problem of its simple motion control in a fixed motion mode."), p. 965 ("Another PI (proportional-integral) controller is designed for the rolling speed in the median sagittal plane."), p. 967 ("[W]e could assume that the rolling speed of the robot can be controlled directly by regulating the drive motor's velocity.").

48. A mobile robot may be programmed to follow a planned trajectory, and/or it may be operable to perform commands received from a user. For example, Ghariblu describes a spherical mobile robot including a wireless receiver for receiving desired path data or manual inputs from a remote control transmitter operated by a user. Exhibit M, *Ghariblu* at Abstract ("This paper deals with the construction and dynamics of a spherical mobile robot."), pp. 3-4 ("The other part is a remote controller with wireless transmitter. This controller has an interface with PC to get the robot path and programs. Meanwhile, it can send the speed of the motors to trace the desired path. Moreover, using the keypad on it, the operator can override the motors speed.").

49. Voice control features have also been implemented in mobile robots in order to make them more easily operated by laypersons. In 2008, Lv suggested implementing voice commands on mobile robots in order to make them "easily operated by [a] human operator, who has limited knowledge about robots or computers." Exhibit N, *Lv* at 2490. Lv developed a voice command control system for a mobile robot that could receive a voice command, such as "go forward," "go backward," "turn left," "turn right," etc., from the user, recognize it, and perform an associated output action. *Id.* at 2492 (Fig. 6), 2493 (Tables I and II).

50. There has also been prior development in giving spherical robots socially interactive and anthropomorphic features in order to facilitate emotional connections between humans and robots. In 2002, Sony announced a spherical mobile robot called "Q-Taro" that was able to "communicate with people through light, sound and motion by using a variety of sensors." Exhibit

O, *Zhan* at 4921. "Sony said the device was developed to foster an emotional connection between humans and robot technology. The infrared sensors can detect the presence of a person and bring the Q-Taro to life while audio sensors enable it to roll around the floor in time to music. The glowing lights can help it show 'emotions,' said Mina Naito, spokeswoman for Sony." Exhibit P, *Williams*. Q-Taro also included voice recognition technology that allowed it to recognize and react to up to ten different words. *Id.*

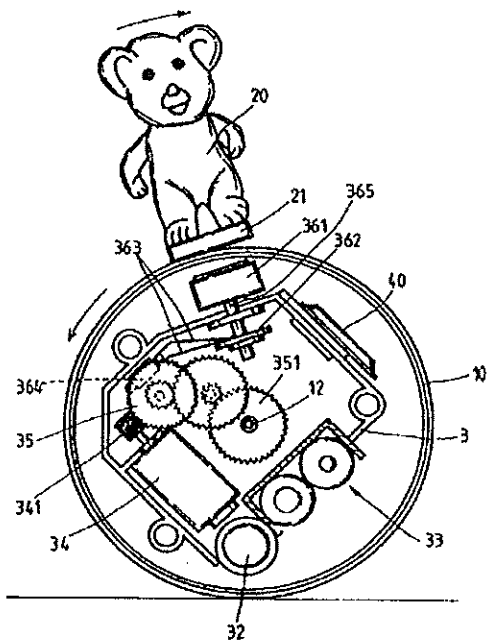
51. The concept of coupling objects to the outer surface of a self-propelled sphere was also a well-known concept. The Cecil patent, which as described above issued over a century ago, describes a self-propelled "ball preferably supporting a figure or other amusing device, which is balanced upon the ball." Exhibit C, *Cecil* at 1:8-14; *see also, id.* at Fig. 1.

52. Utilizing magnetic coupling to adhere an object to the external surface of a self-propelled sphere was also well known. For example, US Patent No. 5,676,582 to Lin, which issued in October 1997, describes a rolling toy including a motor within a sphere body and first and second magnetic elements. Exhibit Q, *Lin* at Abstract ("A rolling toy includes a sphere body composed of two parts between which a axle is connected, a frame disposed in the sphere body and having a motor disposed thereto . . . including a switch element and a first magnetic element, a weight disposed to the frame and located opposite to the first magnetic element, a second magnetic element magnetically adhered to an outer surface of the sphere body and magnetically lifting the first magnetic element . . . ."). The second magnetic element 21, which is attached to a toy bear 20, is magnetically adhered to the external surface of the sphere via an interaction with the first magnetic element 361, which is located within the sphere:

> A second magnetic element 21 is provided at an outer surface of the sphere body 10 and the second magnetic element 21 has a toy bear 20 connected thereto. The second magnetic element 21 is magnetically adhered to the sphere body 10 by the first magnetic element 361 so as to magnetically lift the first magnetic element 361

> to contact the actuating plates 363 by the two disks 362 thus engaging the switch element 364 and actuating the motor 34.

Id. at 2:52-59.



Id. at Fig. 5. The second magnetic element 21 and the bear 20 "will maintain the upper position when the sphere body 10 is rolling." *Id.* at 2:67-3:2.

53. This concept was also demonstrated in the xkcd comic strip by Randall Munroe entitled "New Pet," which published in 2008:

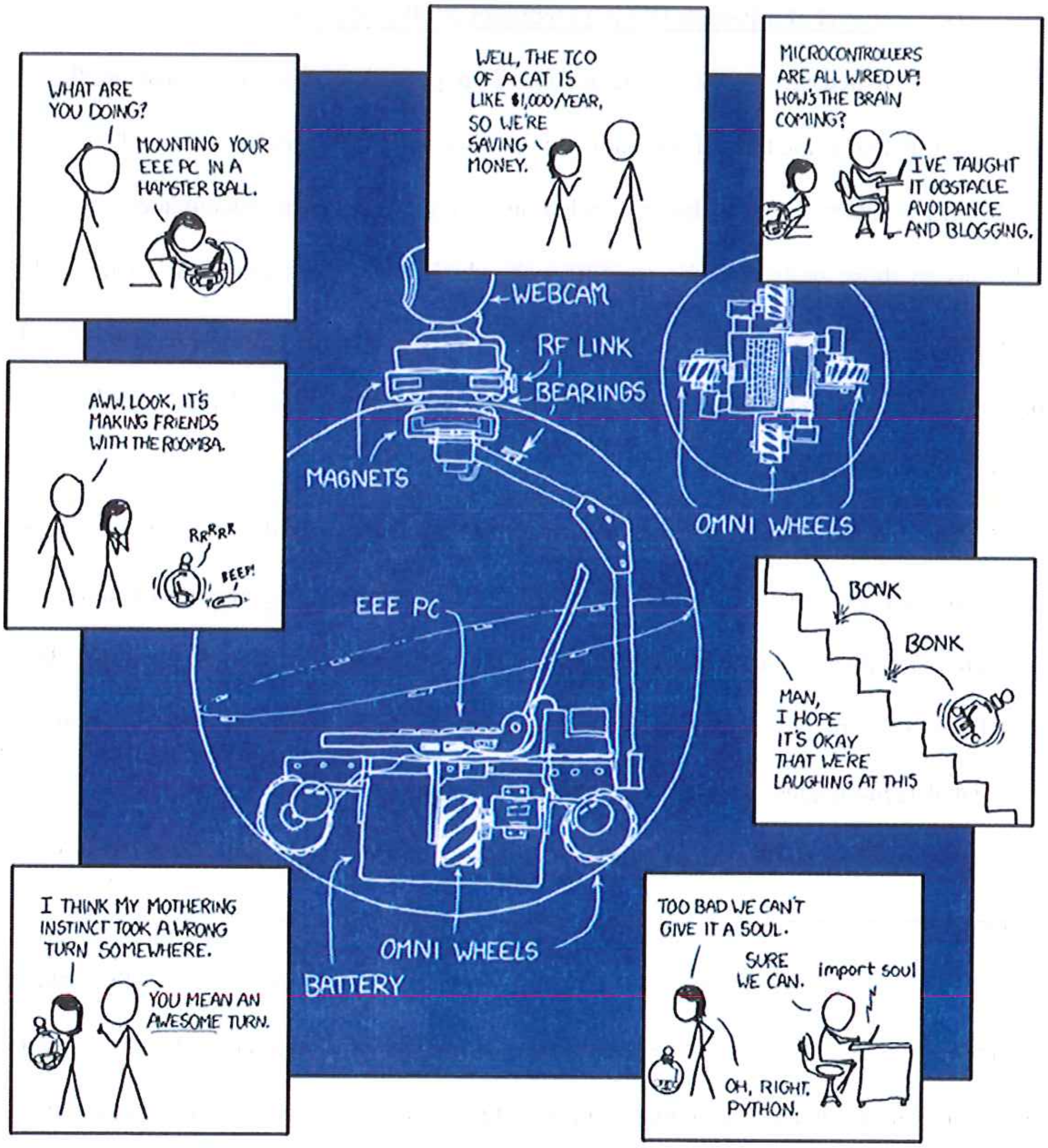


Exhibit R, *Munroe*. As demonstrated in the schematic drawing above, an external webcam is adhered to the external surface of the spherical robot using magnets positioned in the base of the webcam and within the sphere. *Id.*

D. <u>Level of a Person Having Ordinary Skill in the Art</u>

54. In determining the characteristics of a hypothetical person of ordinary skill in the art of the '920 Patent at the time of the claimed invention, which counsel has informed me is August 13, 2014, I considered several factors, including the type of problems encountered in the art, the solutions to those problems, the rapidity with which innovations are made in the field, the sophistication of the technology, and the education level of active workers in the field. I also placed myself back in the time frame of the claimed invention and considered the colleagues with whom I had worked at that time.

55. In my opinion, a person of ordinary skill in the art would have had an undergraduate degree or equivalent in physics, electrical engineering, mechanical engineering, or similar science or engineering degree, and at least two years of industry experience (or, with a graduate degree in the above-stated fields, at least one year of experience) in designing and developing robots and associated technologies. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience.

56. Based on my education, training, and professional experience in the field of the claimed invention, I am familiar with the level and abilities of a person of ordinary skill in the art at the time of the claimed invention. Additionally, I was at least a person having ordinary skill in the art as of the priority date of the '920 Patent.

57. I understand that Sphero's expert, Mr. Duffner, has proposed a different definition for the level of a person having ordinary skill in the art, which is reproduced below:

> Based on this information I believe that a PHOSITA, as of the August 13, 2014 priority date, would have had a bachelor's degree in physics, mechanical, industrial, electrical engineering, or equivalent degree, or the equivalent work experience, plus two years of work experience in electromechanical mechanisms and controls, such

> as robots. Alternatively, a PHOSITA could have a graduate degree in the above stated fields, plus at least one year of experience. Alternatively still, a PHOSITA could also be a person without a Bachelor's degree, but with several more years of similar experience. I understand that the theoretical PHOSITA would also be familiar with all of the relevant prior art.
>
> More specifically, a PHOSITA would be familiar with typical elements of product design for similar remote controlled robotic-like products. These technologies include drive mechanisms, static and dynamic mechanical stability devices, remote controllers, and calculation of rectilinear, curvilinear, angular, and rotational motion relating to operation of devices. A PHOSITA would also understand communications technology such as wireless internet protocols and infrared based technology, and would also have a basic knowledge of plastics, molding, metals, surfaces, and manufacturing of housings for consumer products. A PHOSITA's knowledge would also include a common understanding of magnets and magnetic materials and the relative costs of manufacturing a device containing all of these elements. My analysis assumes the perspective of a PHOSITA. I consider myself to be at least a PHOSITA.

¶¶16-17

58. I would note that, while I meet Mr. Duffner's proposed definition for the level of a person having ordinary skill, I do not necessarily agree with all aspects of his definition. For example, the '920 patent is not limited to consumer products in any way. Consequently, I disagree that a PHOSITA would need to know about the manufacturing of housings for consumer products. Similarly, because the '920 patent is not limited to a product within a specific price range, I disagree that a PHOSITA would need to know the relative costs of manufacturing a device, much less the relative costs of manufacturing a device with the all of the approximately 18 separate elements he listed.

59. However, my opinions are the same regardless of which definition is used.

V. OPINION

A. <u>Analysis of the Accused Product</u>

60. In order to properly assess whether or not the Spin Master's BB-8 ("the Accused Product") infringes claims 19 and 20 of the '920 Patent, I first found it necessary to understand

how the Accused Product operates. In order to gain this understanding, I have inspected the Accused Product and personally spoken to a Spin Master employee, Christopher Hardouin on August 9, 2017 to confirm my understanding. Additionally, I conducted my own analysis of these issues.

61. The Accused Product is a spherical mobile robot. The Accused Product includes a spherical body and a head positioned on top of the spherical body.

62. As part of my inspection, I inspected the interior assembly held within the spherical body. The internal assembly includes [redacted]

63. The sphere's drive system [redacted]. This is very different than the wheeled drive described in the '920 Patent. As described above, the '920 Patent's wheeled drive initiates motion of the sphere by driving along the sphere's interior surface, moving away from the valley, and ascending the inner wall, which results in the entire internal assembly pitching backwards as shown in Figure 4 of the '920 Patent. *See,* ¶¶32-33. The Accused Product's drive does not need [redacted]

64. The Accused Product also includes [redacted]

[redacted].

65. The Accused Product has different modes of operation, including an RC control mode, a voice control mode, and a "Follow Me" mode. In RC and voice control modes, the head control system also [redacted]. In RC control mode, [redacted]. When the user presses the "Forward" button on the remote control, for example, the drive system [redacted]. This animation creates the realistic effect of BB-8 moving forward as shown in the *Star Wars: The Force Awakens* movie. The head control system also performs certain other animations with the head when in voice control mode.

B. <u>Sphero Has Failed to Show Infringement of the Accused Product</u>

66. I understand that to prove infringement Sphero must provide evidence showing that each limitation of each asserted claim is present in the Accused Product. To meet this burden, I understand that Sphero has primarily relied on the opinions provided in a declaration by Mr. Dirk Duffner. I have analyzed Mr. Duffner's declaration as well as the attached appendices and exhibits.[1]

67. In addition, I have also analyzed Sphero's commercial BB-8 (described above). I also reviewed Hasbro's BB-8 product, [redacted]. The product packaging of Sphero's BB-8 indicates that it is meant for ages 8 and older, and is controlled using a smartphone "app." The Accused Product, on the

[1] I have also analyzed the declaration of Dr. Erich Phillips as well as the attached appendices and exhibits.

other hand, is marketed to children 6 or older, and is controlled with a simple R/C controller. Similarly, Hasbro's BB-8 was designed for, and is marketed to, children 5 or older.

68. The overarching flaw with Mr. Duffner's analysis is his sole reliance on unfounded assumptions regarding the mechanical structure of the components within the Accused Product's housing. Mr. Duffner admits that he has not inspected the Accused Product, and he also admits that he does not know "the exact mechanics of its robot, and how the various components are arranged internally." *Duffner Declaration*, at ¶ 65. Rather, Mr. Duffner, speculatively concludes that each claim element is met based on outdated YouTube videos that allegedly show a prototype device being operated at a toy fair. *Id.* at ¶ 46. [redacted] Exhibit S, Tillman Affidavit at 4.

69. Claims 1, 19, and 20 of the '920 Patent require the elements held within the spherical housing to be arranged in a very specific way. Specifically, independent claim 1, which is the claim from which both claims 19 and 20 ultimately depend, requires "a drive system provided within the spherical housing, one or more magnetic components, and an internal component that extends from the drive system to position the one or more magnetic components within an interior of the spherical housing, so as to be diametrically opposed to a point of contact between the spherical housing and an underlying surface . . . wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing."

70. In order to form a factually supported opinion regarding the infringement of internal mechanical configuration of Spin Master's BB-8, Mr. Duffner would have needed to rely on something more than YouTube videos of the product operating. For example, Mr. Duffner would

have needed to base his opinions on a physical inspection of the product, schematics, diagrams, or similar materials. Contrary to Mr. Duffner's suggestion, no person having ordinary (or expert level) skill in the art would be able to look at videos of the Accused Product operating and have the facts necessary to conclude that it meets every claim limitation. As such, Mr. Duffner's unsupported assumptions regarding the internal mechanical structure of the Accused Product are wholly insufficient to establish infringement of the '920 Patent.

1. Claim 1

71. Since all that is necessary for non-infringement is to show that at least one claim limitation is not present in the Accused Product, my analysis primarily focuses on the limitation "wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing." [2]

72. Regarding the construction of this limitation, Mr. Duffner opined that a "PHOSITA would understand, without further construction, that the plain and ordinary meaning of this term is consistent with the disclosure." *Duffner Declaration*, at ¶ 36. I agree that the plain and ordinary meaning of this claim limitation is clear and that no separate construction of this claim limitation is required.

73. However, Mr. Duffner also confusingly offers an apparent proposed construction for this limitation, "Therefore, a PHOSITA would understand that the propulsion of the sphere from the drive system causes the internal component to change relative to the vertical." *Id.* at ¶ 36. Mr. Duffner also provides a table summarizing his claim construction positions claiming both no

2 This analysis is not meant to be a comprehensive report detailing all of the reasons the Accused Product does not infringe the '920 Patent. Rather, I have just focused on certain limitations to show why Sphero has not met their burden for purposes of their Motion for Preliminary Injunction. Other non-infringement positions may exist, and I reserve the right to supplement my opinions as the case progresses.

construction is necessary for this claim limitation while also offering a slightly different construction:

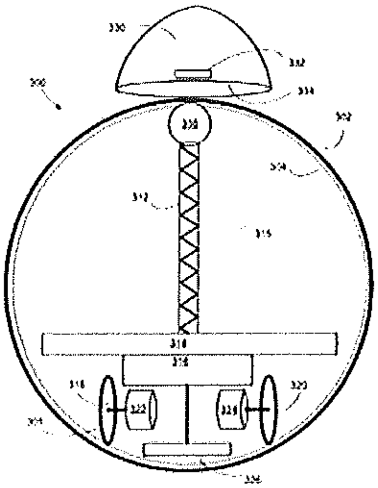
Analysis
Plain and ordinary meaning – no construction necessary. The sphere's motion due to the drive system causes the internal component, that positions the internal magnetic components, to change its angle with respect to a vertical vector.

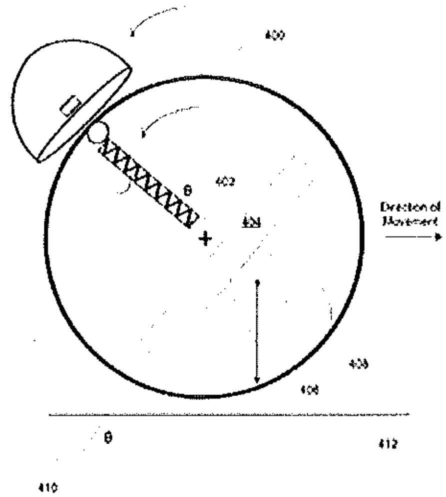
p. 21.

74. Thus, Mr. Duffner's constructions of this claim limitation appear to shift the cause of the internal component's angular displacement to the sphere's movement/propulsion instead of the drive system. Mr. Duffner's analysis seems to confirm that this is the interpretation that he has applied. *See e.g.*, *id.* at ¶ 78 ("When the drive system is prompted to roll, it maneuvers the spherical housing and this results in the interior structure tilting off vertical . . . .").

75. The plain language of the claim requires "the **drive system**, in maneuvering the spherical housing, **causes the internal component to angularly displace relative to a vertical axis of the spherical housing**."

76. The plain language of the claim is consistent with the '920 Patent specification. For example, Figures 3 and 4 of the '920 Patent show that the internal component, which is referred to as the biasing mechanism 315, is attached to, and thus moves with the drive system:





77. As demonstrated in Figure 4, when the drive accelerates from rest, for example, the drive initiates motion of the sphere by driving along the sphere's interior surface, moving away from the valley, and ascending the inner wall. As shown above, the drive system pitches up as it ascends the inner wall of the sphere. This results in the angular displacement of the internal component/biasing mechanism because it is rigidly attached to the drive system.

78. The '920 Patent specification further states:

> The spring end 310 can be designed to provide near-frictionless contact with the inner surface 304. The spring end 310 can comprise a rounded surface configured to mirror a low-friction contact region at all contact points with the inner surface 304. Additional means of providing near-frictionless contact may be provided. In another implementation, the rounded surface may include one or more bearings to further reduce friction at the contact point where end 310 moves along inner surface 304. 9:66-10:7.

79. Given that the '920 Patent intends the point where the internal component contacts the interior of the sphere to be "near-frictionless" any movement of the sphere will not influence the orientation of the internal component. In other words, since the internal component does not "stick" to the interior surface of the spherical housing, the movement of the spherical housing will not "drag" the internal component, which would cause it to angularly displace.

80. Therefore, I do not agree with Mr. Duffner's apparent construction/interpretation that the sphere's motion or propulsion causes the internal component to angularly displace relative to the vertical axis as the claim clearly requires the drive system to cause the angular displacement of the internal component.

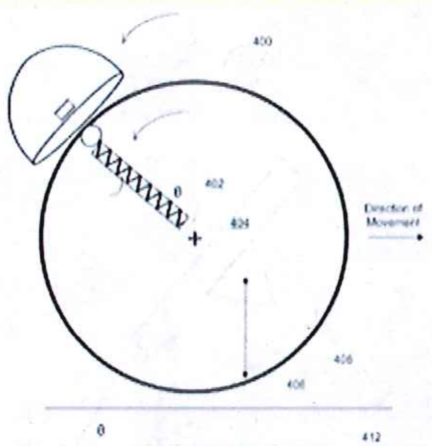
81. Regarding Spin Master's alleged infringement of this claim limitation, Mr. Duffner opines, "[w]hen the drive system is prompted to roll, it maneuvers the spherical housing and this results in the interior structure tilting off vertical (i.e., it causes the internal component to angularly displace relative to a vertical axis of the spherical housing"). *Duffner Declaration*, at ¶ 78; *see also,* ¶ 83 ("More specifically, when the Spin Master BB-8 is directed to begin movement, acceleration occurs, thereby causing the interior chassis to tilt from vertical. . . . Since the head is coupled to the drive train, it can serve as a proxy for the angular displacement of the internal component."). Mr. Duffner does not cite to any facts to support this opinion, and based on my analysis of the Accused Product, I can confirm that Mr. Duffner's opinion is completely false.

82. Contrary to Mr. Duffner's assumptions, the Accused Product includes [redacted]

83. As such, contrary to Mr. Duffner's opinion, [redacted] The Accused Product therefore does not meet the limitation "wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing" under either Sphero's interpretation of the claim or the plain and ordinary meaning.

84. Moreover, Mr. Duffner should have known his guesswork was wrong, and mischaracterized the Spin Master BB-8 prototype. As shown in the following side-by-side comparison of the '920 Patent's Figure 4 and Exhibit 4d of Mr. Duffner's Declaration, despite the fact that the Spin Master BB-8 prototype and the spherical device depicted in Figure 4 of the '920 Patent are traveling in the same direction, prototype's head is tilting in the opposite direction as the head shown in the '920 Patent.

Direction of Movement



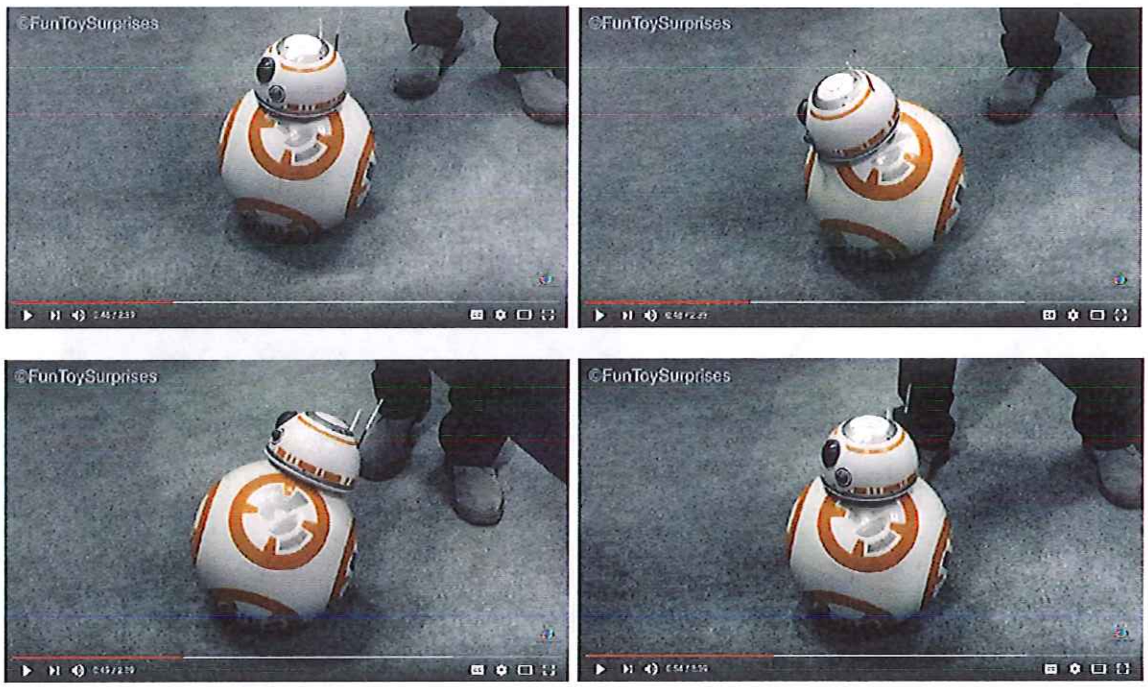
'920 Patent

Spin Master's BB-8 Prototype

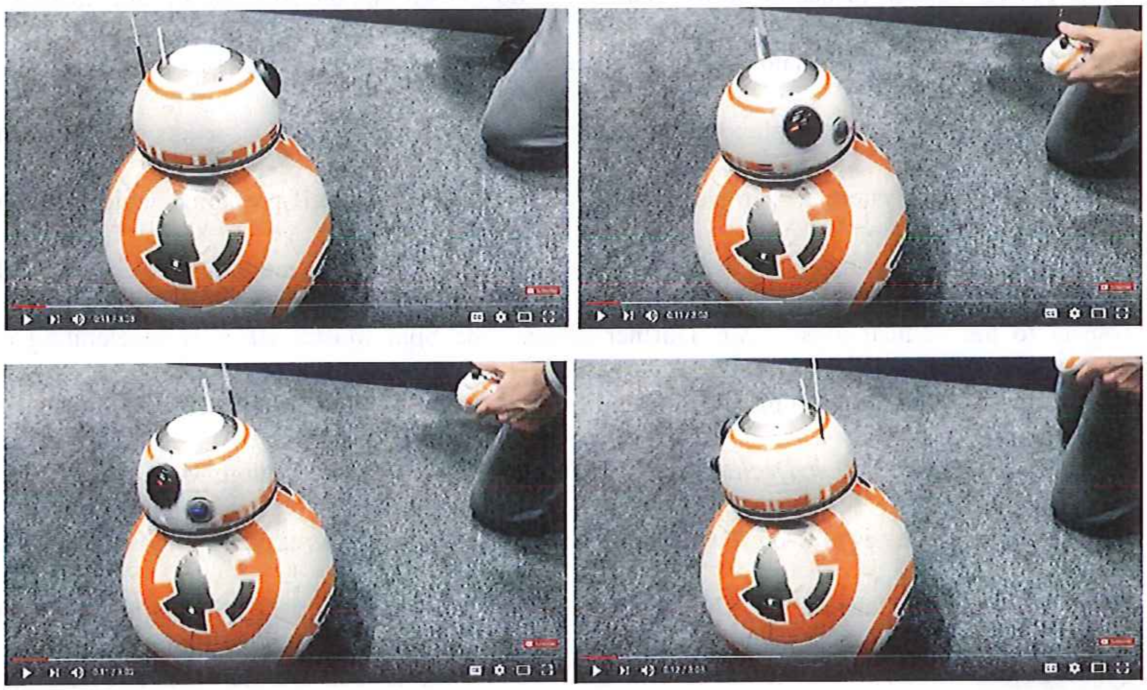
85. If the prototype had the same arrangement of internal components as required by claim 1, then it should behave as shown in Figure 4 of the '920 Patent. Namely, BB-8's head should be tilting in the **opposite direction** as the direction of movement of the sphere. Here, BB-8's head is tilting in the **same direction** as the direction of movement of the sphere. This implies that any internal component in the prototype, such that it exists, [redacted]

86. In fact, the other video exhibits relied upon by Duffner show the prototype moving in a way that should have indicated to Duffner that the prototype did not include a system that infringed the '920 Patent:

(a) In Exhibit 2, from the 0:46-0:54 mark, the head pivots and rotates independent of any movement by BB8:



(b) In Exhibit 4, from the 0:11-0:15 mark, the prototype's head is seen rotating about the vertical axis while the spherical housing remains stationary, motion that would not be possible if the claimed '920 system was being utilized:



87. These screenshots show that [redacted] further confirm that Mr. Duffner should have known that any alleged "internal component" in the prototype is [redacted]. Therefore, Sphero has not shown that the prototype meets the limitation "wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing."

2. *Claim 19*

88. Claim 19 requires, "The system of claim 1, wherein the drive system is operable to accelerate or decelerate the self-propelled device to make the internal component angularly displace by a variable tilt angle that is more than 10 degrees with respect to the vertical axis . . . ."

Since claim 19 depends on claim 1, I understand that to prove infringement of claim 19, Sphero must also prove that the Accused Product meets all of the limitations of independent claim 1 as well. For the reasons discussed above, Sphero has not shown that the Accused Product infringes claim 1, and therefore, it has not shown that claim 19 is infringed for the same reasons.

89. Additionally, Sphero has not shown that the Accused Product meets the limitation "wherein the drive system is operable to accelerate or decelerate the self-propelled device to make the internal component angularly displace by a variable tilt angle that is more than 10 degrees with respect to the vertical axis." Mr. Duffner opines "the Spin Master BB-8 is accelerating or decelerating constantly, causing an angular displacement, often greater than ten degrees, during typical operation." *Duffner Declaration*, at ¶ 98. As support for this opinion, Mr. Duffner relies on Dr. Phillip's analysis of a YouTube video. *Id.* at ¶ 99. However, as explained above, the video relied on by Mr. Duffner and Dr. Phillips is of a prototype BB-8 that [redacted] Exhibit S, Affidavit of Tillman at 4. Therefore, Mr. Duffner does not have any evidence showing that the Accused Product meets this limitation.

90. Regarding this limitation, Mr. Duffner opines, "Accelerating or decelerating the robot via the drive system . . . operates to apply rotational force on the inside of the sphere. . . ." This motion, in turn, causes the internal component to tilt (i.e., angularly displace) by a variable amount relative to the vertical axis (i.e., a variable tilt angle). This is incorrect for all of the reasons I described above with regard to claim 1. *See,* ¶¶ 81-83.

91. Moreover, it is my opinion that [redacted] would prevent the internal assembly from tilting more than 10 degrees with respect to the vertical axis. Illustrated below are [redacted]. I

wish to emphasize that [redacted] rather, it presents a worsts-case, generic scenario where the internal structure is rigid and spans the inner sphere diameter. [redacted]

Redacted

92. To add to this worst-case scenario, [redacted]

Redacted

93. From my inspection of the Accused Product, [redacted]

Redacted

or,

Redacted

and,

Redacted

Thus, the drive motor must be able to generate at least the following torque as a fraction of the product of the total tiltable mass, *M*, and the maximum tiltable radius, *R* to produce a 10-degree tilt:

Redacted

The [redacted] Consequently, [redacted]l, the Accused Product does not infringe Claim 19 of the '920 patent.

3. *Claim 20*

94. Claim 20 of the '920 Patent 20 requires "[t]he system of claim 19, wherein the variable tilt angle is more than 45 degrees with respect to the vertical axis." Since Sphero has not shown that the Accused Product infringes claims 1 or 19, it has also failed to show infringement of claim 20.

95. As discussed with regard to claim 19, Mr. Duffner and Dr. Phillip's analysis allegedly showing infringement of this limitation was based on a Youtube video of a prototype BB-8 [redacted]. Exhibit S, Affidavit of Tillman at 4. Therefore, Mr. Duffner does not have any evidence showing that the Accused Product meets this limitation.

96. Moreover, it is my opinion that [redacted] would prevent the internal assembly from tilting more than 45 degrees with respect to the vertical axis. Illustrated below are [redacted]. I wish to emphasize that [redacted] rather, it presents a worsts-case, generic scenario where the [redacted]

Redacted

97. To add to this worst-case scenario, we further assume that the sphere acts as a static pivot point. In reality, this would not be the case as the sphere would compliantly move and reduce the allowable counter-torque, $\tau_{Ctr\text{-}Drive}$. For this worst-case, rigid-internal-component-and-static-load scenario,

Redacted

98. From my inspection of the Accused Product, [redacted]:

Redacted

or,

Redacted

and,

Redacted

Thus, [redacted]

Redacted

The sphere drive motor on the Accused Product [redacted]. Consequently, [redacted] the Accused Product does not infringe Claim 20 of the '920 patent.

C. Claims 1, 19, and 20 of the '920 Patent are Invalid

1. *Invalidity Analysis Under Sphero's Interpretation of the Claims*

99. Counsel has informed me that since the Honggang patent (Exhibit T) published on April 15, 2009 it qualifies as prior art with regard to the '920 Patent at least under 35 U.S.C. § 102(a)(1) of the America Invents Act. As shown in the chart in **Appendix A,** the Honggang patent anticipates claims 1, 19, and 20 because it expressly or inherently discloses every limitation using Sphero's interpretation of the claims. My analysis of the prior art in Appendix A applies Mr. Duffner's apparent interpretations of the claim language as expressed in his declaration in ¶¶ 24-44, Tables 1-3, and throughout his infringement analysis.[3]

[3] My application of Sphero's claim interpretations to the prior art does not mean that I agree that they are correct. This invalidity analysis is meant to show that the claims are invalid over the prior art when using Sphero's broad interpretation of the claim language.

2. *Invalidity Analysis Under Spin Master's Interpretation of the Claims*

100. I understand that Spin Master previously filed an *inter partes* review (IPR) proceeding at the United States Patent and Trademark office challenging the validity of claim 1 among other claims. Exhibit U, *'920 IPR Petition.* In fact, I prepared a declaration in that proceeding opining on issues relating to the invalidity of claim 1.

101. I have reviewed and analyzed Petitioner's proposed rejections for claim 1 presented in the '920 IPR Petition as well as the underlying references, and I agree with these rejections and incorporate them herein by reference. Specifically, I incorporate by reference the rejection showing claim 1 of the '920 Patent is obvious under 35 U.S.C. §103 over U.S. Patent No. 8,269,447 to Smoot et al. ("Smoot") (Exhibit V) in view of U.S. Patent Application Publication No. 2012/0168240 to Wilson, et al. ("Wilson") (Exhibit W). I also incorporate by reference the rejection showing claim 1 of the '920 Patent is obvious under 35 U.S.C. §103 over Smoot, Wilson, and the knowledge of a person having ordinary skill in the art.

102. I also incorporate by reference the relevant opinions I offered in the declaration accompanying the '920 IPR Petition, which is attached as Exhibit X.

103. The '920 IPR Petition did not challenge claims 19-20. Nevertheless, it is my opinion that Smoot inherently discloses these limitations. For the reasons described in my declaration accompanying the '920 IPR Petition, Smoot's locomotive driver 1050 (i.e., drive system) necessarily causes the support beam 1030 (i.e., internal component) to angularly displace relative to a vertical axis of the spherical body when maneuvering the sphere. Exhibit X at ¶¶52-76.

104. I understand that the use of the phrase "operable to" in patent law simply means "capable of performing the recited function." As shown in the side-by-side comparison of Figure 10 of Smoot and Figure 3 of the '920 Patent, Smoot has an identical arrangement of structure components as claimed by the '920 Patent:

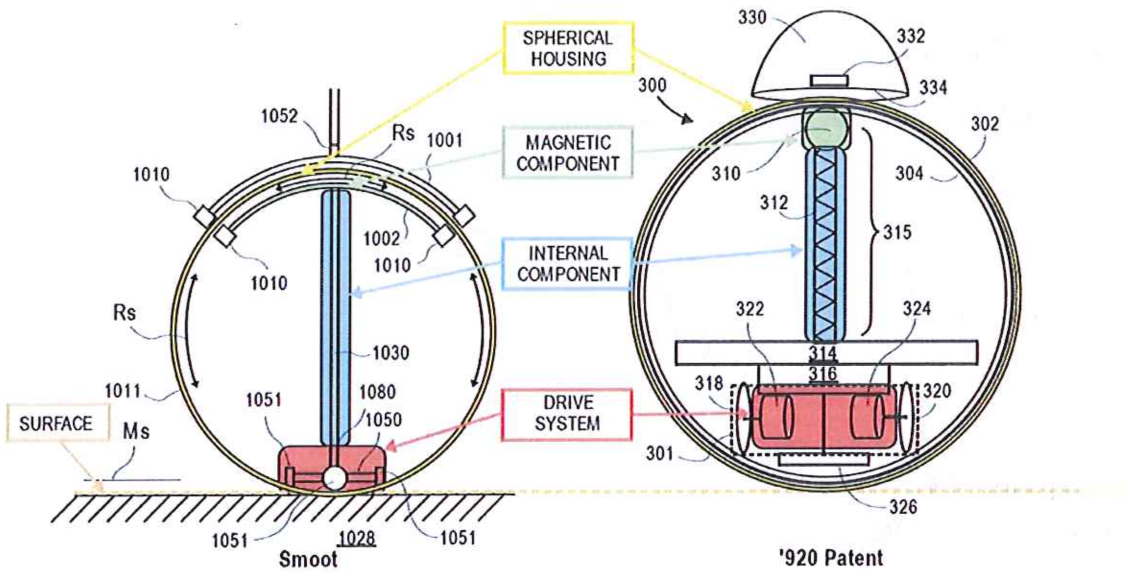


Exhibit U, *'920 Patent IPR Petition* at p. 30.

105. Therefore, Smoot's locomotive driver 1050 "is operable to accelerate or decelerate the self-propelled device to make the internal component angularly displace by a variable tilt angle that is more than 10 degrees with respect to the vertical axis, while the accessory device maintains continuous contact with the exterior surface of the spherical housing" as required by claim 19.

106. Further Smoot inherently discloses the limitation "wherein the variable tilt angle is more than 45 degrees with respect to the vertical axis" for the same reasons.

I swear under penalty of perjury that all of the above is a true and correct account of matters within my knowledge.

FURTHER AFFIANT SAYETH NAUGHT.

August 14, 2017.

By: ______________________
Jason Janét

STATE OF NC)
COUNTY OF Wake)

The foregoing instrument was acknowledged before me this 14th day of August, 2017, by Jason Janét.

Witness my hand and official seal.

My commission expires: 5-7-2022

RUTH E. CRUZ-NICHOLS NOTARY PUBLIC MY COMMISSION EXPIRES 5-7-22 WAKE COUNTY, NC

Ruth E. Cruz-Nichols
Notary Public